STATUS OF THE CLAIMS

1. (Withdrawn) An apparatus for modifying a top conductive surface of a multi-layer workpiece in the presence of a solution, the apparatus comprising:

an electrochemical mechanical processing system adapted to process the top conductive layer of the workpiece in the presence of an applied potential and the solution and thereby establish planarity to the top conductive layer, the electrochemical mechanical processing system including a workpiece surface influencing device disposed in proximity to the workpiece during electrochemical mechanical processing; and

a sensor adapted to provide a signal that contains information indicative of the planarity of the top conductive layer at various points in time during processing of the top conductive layer by the electrochemical mechanical processing system.

2. (Withdrawn) The apparatus according to claim 1 wherein the electrochemical mechanical processing system provides for electrochemical mechanical deposition that plates a conductor from the solution onto the top conductive surface of the workpiece, and wherein the sensor includes a light source and an optical sensor adapted to detect a reflected light beam obtained from a light beam from the light source that has been reflected from the top conductive surface of the workpiece during deposition of the conductor.

3. (Withdrawn) The apparatus according to claim 2 wherein the reflected light beam is used to indicate a surface roughness of the workpiece, the planarization of the top conductive layer causing a greater amount of the reflected light beam to be sensed by the optical sensor than prior to the planarization of the top conductive layer.

4. (Withdrawn) The apparatus according to claim 3 wherein the sensor senses the surface roughness of the workpiece prior to deposition of the conductor, which surface roughness exists due to features disposed below the top conductive surface, and wherein the sensor senses planarity of the top conductive surface of the workpiece when top surface features corresponding to the features disposed below from the top conductive surface are reduced due to the conductor being deposited within the top surface features.

5. (Withdrawn) The apparatus according to claim 4 wherein the signals provided by the sensor, when the top conductive surface of the workpiece is planarized, are input to a processor that operates upon the signals to provide a planarization signal.

6. (Withdrawn) The apparatus according to claim 5 wherein the processor provides the planarization signal to the electrochemical mechanical processing system when planarization of the top conductive layer is achieved,

7. (Withdrawn) The apparatus according to claim 6, wherein the electrochemical mechanical processing system, upon receipt of the planarization signal, performs another electrochemical mechanical process different from electrochemical mechanical deposition.

8. (Withdrawn) The apparatus according to claim 1 wherein the sensor includes an optical system comprising at least one light source and at least one light sensor, the optical system adapted to transmit an input beam of light from the at least one light source onto the top conductive surface of the workpiece and to detect a reflected beam of light with the light sensor and generate the signal.

9. (Withdrawn) The apparatus according to claim 8 wherein the light source emits a beam of light having a wavelength determined based upon a material that forms the top conductive surface.

10. (Withdrawn) The apparatus according to claim 8 wherein the light sensor detects the reflected beam of light with an increased intensity when a substantial planarity of the top conductive surface of the workpiece is achieved.

11. (Withdrawn) The apparatus according to claim 10 wherein the electrochemical mechanical processing system provides for electrochemical mechanical deposition that deposits a conductor onto the top conductive surface, and wherein the substantial planarity of the surface of the workpiece occurring as a result of the conductor filling patterns within the top conductive surface of the workpiece.

12. (Withdrawn) The apparatus according to claim 11 wherein the light sensor detects that the intensity of the reflected beam of light changes as the planarity of the surface of the workpiece changes.

13. (Withdrawn) The apparatus according to claim 11 wherein the optical detector detects that the intensity of the reflected beam of light increases as the planarity of the surface of the workpiece increases.

14. (Withdrawn) The apparatus according to claim 11 wherein the optical system further includes a processing circuit that generates a planarization signal from a plurality of the signals when the top conductive surface of the workpiece is planarized.

15. (Withdrawn) The apparatus according to claim 14 wherein the processing circuit is a computer.

16. (Withdrawn) The apparatus according to claim 8 wherein the reflected light beam is used to indicate a surface roughness of the workpiece, and planarization of the top conductive layer causing a greater amount of the reflected light beam to be sensed by the optical sensor than a non-planarized top conductive layer.

17. (Withdrawn) The apparatus according to claim 16 wherein the sensor senses the surface roughness of the workpiece initially upon operation upon the conductive top surface layer by the electrochemical mechanical processing system and the sensor senses planarity of the top conductive surface by providing the signals with the information indicative of the planarity of the top conductive layer being an intensity value that exceeds a predetermined threshold.

18. (Withdrawn) The apparatus according to claim 17 wherein the signals provided by the sensor, when the top conductive surface of the workpiece is planarized, are input to a processor that operates upon the signals to provide a planarization signal.

19. (Withdrawn) The apparatus according to claim 18 wherein the processor provides the planarization signal to the electrochemical mechanical processing system when planarization of the top conductive layer is achieved,

20. (Withdrawn) The apparatus according to claim 16 wherein the electrochemical mechanical processing system provides for electrochemical mechanical etching that removes a conductor from the top conductive surface of the workpiece.

21. (Withdrawn) The apparatus according to claim 20 wherein the sensor senses the surface roughness of the workpiece initially upon performing electrochemical mechanical etching of the conductive top surface layer by the electrochemical mechanical processing system and the sensor senses planarity of the top conductive surface by providing the signals with the information

indicative of the planarity of the top conductive layer being an intensity value that exceeds a predetermined threshold.

22. (Withdrawn) The apparatus according to claim 21 wherein the signals provided by the sensor, when the top conductive surface of the workpiece is planarized, are input to a processor that operates upon the signals to provide a planarization signal.

23. (Withdrawn) The apparatus according to claim 22 wherein the processor provides the planarization signal to the electrochemical mechanical processing system when planarization of the top conductive layer is achieved,

24. (Withdrawn) The apparatus according to claim 16 wherein the workpiece includes a barrier layer disposed below the top conductive layer, and the optical detector detects that the intensity of the output beam of light abruptly changes when the barrier layer is exposed.

25. (Withdrawn) An apparatus for operating upon a multi-layer workpiece using a solution, the apparatus comprising:

electrochemical mechanical processing equipment adapted to operate on a top layer of the workpiece in the presence of an applied potential and the solution using a workpiece surface influencing device, the top layer of the workpiece being formed of a material; and

an optical system comprising at least one light source and at least one light sensor, the optical system adapted to transmit a beam of light from the at least one light source onto the top layer of the workpiece and to detect a reflected beam of light with the light sensor, the reflected beam of light providing at different points in time a signal with a reflectivity characteristic indicative of an amount of planarity of the top layer of the workpiece.

26. (Withdrawn) The apparatus according to claim 25 wherein the optical system further includes a processor adapted to provide a planarization signal to the electrochemical mechanical processing equipment based upon the signal obtained at different points in time, the planarization signal indicating that the top layer of the workpiece is substantially planar.

27. (Withdrawn) The apparatus according to claim 26 wherein, upon receipt of the planarization signal, the electrochemical mechanical processing equipment is operated to perform a different operation.

28. (Withdrawn) The apparatus according to claim 27 wherein the electrochemical mechanical processing system provides electrochemical mechanical deposition that plates a

conductor from the solution onto the top layer of the workpiece and wherein the top layer is an insulator.

29. (Withdrawn) The apparatus according to claim 28 wherein the optical reflection from the top layer of the workpiece is indicative of a surface roughness of the top layer, the sensor further adapted to provide the indication to the electrochemical mechanical processing system when planarization of the top layer is achieved, the planarization of the top layer causing a greater amount of reflected light to be sensed by the optical sensor than prior to the planarization of the top layer.

30. (Withdrawn) The apparatus according to claim 29 wherein the sensor senses the surface roughness of the workpiece prior to deposition of the conductor, which surface roughness exists due to features within the top layer, and wherein the sensor senses planarity of the top layer of the workpiece when the features are reduced due to the conductor being deposited within the features.

31. (Withdrawn) The apparatus according to claim 30 wherein the signals provided by the sensor, when the top surface of the workpiece is planarized, are input to a processor that operates upon the signals to provide a planarization signal.

32. (Withdrawn) The apparatus according to claim 31 wherein the processor provides the planarization signal to the electrochemical mechanical processing system when planarization of the top layer is achieved,

33. (Withdrawn) The apparatus according to claim 25 wherein the reflected beam of light has an intensity corresponding to the reflectivity characteristic.

34. (Previously Presented) A method for detecting planarization of a top surface of a workpiece with features in an electrochemical mechanical deposition process that uses a solution containing a conductor therein and operates upon the top surface comprising the steps of:

depositing the conductor to fill the features within the top surface of the workpiece using electrochemical mechanical deposition employing a workpiece surface influencing device, an applied potential and the solution;

transmitting a beam of light onto the top surface of the workpiece to obtain a reflected beam of light, a characteristic of the reflected beam of light being altered by a top surface pattern that exists due to the features within the top surface of the workpiece; and

detecting a change in the characteristic of the reflected beam of light indicative of a degree of planarization to the top surface of the workpiece.

35. (Previously Presented) The method according to claim 34 further including the step of terminating the electrochemical mechanical deposition at a predetermined degree of planarization.

36. (Previously Presented) The method according to claim 35 further including a material removal step.

37. (Previously Presented) The method according to claim 36 wherein the material removal step performs chemical mechanical processing.

38. (Previously Presented) The method according to claim 36 wherein the material removal step performs electrochemical mechanical polishing and further comprises the steps:

transmitting another beam of light onto the top surface of the workpiece to obtain another reflected beam of light; and

detecting a change in a characteristic of the another reflected beam of light indicative of ~~a~~ another material on the top surface of the workpiece.

39. (Previously Presented) The method according to claim 38 wherein the beam of light and the another beam of light are from a same source.

40. (Original) The method according to claim 34 wherein the characteristic is intensity of the reflected beam of light.

41. (Original) The method according to claim 34 wherein the beam of light transmitted onto the top surface of the workpiece passes through the workpiece surface influencing device.

42. (Original) The method according to claim 41 wherein the characteristic is intensity of the reflected beam of light.

43. (Original) The method according to claim 34 wherein the beam of light transmitted onto the top surface of the workpiece is adjacent to the workpiece surface influencing device.

44. (Original) The method according to claim 43 wherein the characteristic is intensity of the reflected beam of light.

45. (Previously Presented) A method for detecting planarization of a top surface of a workpiece in an electrochemical mechanical deposition process that uses a solution containing a conductor therein, the steps comprising:

electrochemically mechanically processing the top surface of the workpiece using a workpiece surface influencing device, an applied potential and the solution to deposit material onto the top surface;

transmitting a beam of light onto the top surface of the workpiece to obtain a reflected beam of light; and

detecting a change in a characteristic of the reflected beam of light indicative of a degree of planarization to the top surface of the workpiece.

46. (Previously Presented) The method according to claim 45 further including the step of terminating the electrochemical mechanical process at a predetermined degree of planarization of the top surface.

47. (Previously Presented) The method according to claim 46 further including the step of removing at least a portion of the material.

48. (Previously Presented) The method according to claim 47 wherein the step of removing performs chemical mechanical processing.

49. (Previously Presented) The method according to claim 47 wherein the step of removing performs electrochemical mechanical polishing and further comprises the steps:

transmitting another beam of light onto the top surface of the workpiece to obtain another reflected beam of light; and

detecting a change in a characteristic of the another reflected beam of light indicative of ~~a~~ another material on the top surface of the workpiece.

50. (Previously Presented) The method according to claim 47 wherein the step of removing performs electrochemical mechanical polishing.

51. (Previously Presented) The method according to claim 45 wherein portions of the top surface is conductive and the step of electrochemically mechanically processing deposits a conductor into features disposed in the top surface of the workpiece.

52. (Previously Presented) A method for detecting planarization of a top surface of a workpiece having a plurality of features comprising the steps of:

depositing the conductor to fill the features within the top surface of the workpiece; and

obtaining a signal indicative of a degree of planarity of the top surface.

53. (Previously Presented) The method according to claim 52 wherein the step of obtaining comprises:

transmitting a beam of light onto the top surface of the workpiece to reflect the beam of light; and

detecting a characteristic of a reflected beam of light from the top surface; and

transforming the characteristic into a signal which corresponds to the degree of planarity of the top surface.

54. (Previously Presented) The method according to claim 53 further including the step of terminating the step of depositing when the planarity of the top surface reaches a predetermined degree.

55. (Previously Presented) The method according to claim 54 further including a material removal step.

56. (Previously Presented) The method according to claim 55 wherein the material removal step performs electrochemical mechanical processing.

57. (Previously Presented) The method according to claim 55 wherein the material removal step includes:

transmitting another beam of light onto the top surface of the workpiece to obtain another reflected beam of light; and

detecting a change in a characteristic of the another reflected beam of light indicative of another material on the top surface of the workpiece.

58. (Original) The method according to claim 53 wherein the characteristic is intensity of the reflected beam of light.

59. (Previously Presented) The method according to claim 58 wherein the intensity increases as the surface of the workpiece becomes more planar.

60. (Previously Presented) The method according to claim 34 wherein the conductor is copper.

61. (Previously Presented) The method according to claim 38 wherein the conductor is copper.

62. (Previously Presented) The method according to claim 38 wherein the another material is a barrier material.

63. (Previously Presented) The method according to claim 40 wherein the intensity increases as the degree of planarization increases.

64. (Previously Presented) The method according to claim 42 wherein the intensity increases as the degree of planarization increases.

65. (Previously Presented) The method according to claim 47 wherein the step of removing performs chemical mechanical polishing and further comprises the steps:

transmitting another beam of light onto the top surface of the workpiece to obtain another reflected beam of light; and

detecting a change in a characteristic of the another reflected beam of light indicative of another material on the top surface of the workpiece.